HP Blade Server bh7800
Site Preparation Guide

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USA

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Preface

Before preparing your site for the HP Blade Server bh7800, familiarize yourself with the components that comprise the bh7800. Use the following reference to determine where to start.

Book Layout

- Chapter 1 – provides an overview of the bh7800 components, cooling air flow, shipping dimensions and weight and CFM value.
- Chapter 2 – provides specific information ensuring the site is ready when the bh7800 arrives. Voltage fluctuations, grounding and floor loading are some of the topics covered.
- Chapter 3 – covers how to power up the bh7800 and how to power down the bh7800. Power distribution information and power cords required are specified.
- Appendix A – provides specifications and requirements necessary to ensure the bh7800 environment provided is suitable for operating the bh7800.
- Appendix B – provides power plug configuration information for the male and female end of the cord set.
- Appendix C – provides conversion factors and formulas used for determining site environment requirements.
- Glossary – provides a list of terms most commonly used in this manual.
- Index - a quick look up table for common terms and components used in this guide.

Publication History

The Site Preparation guide was never assigned a manufacturing part number. The method for tracking revisions will be this table.

Table 1 Publication History

Edition	Comments
First	December 2001 release. CD-ROM, EPSS Web site, and http://docs.hp.com delivery mechanisms.
Second	April 2002 release. CD-ROM, EPSS Web site, and http://docs.hp.com delivery mechanisms. Power dissipation values in appendices were revised.
Third	June 2002 release. CD-ROM, EPSS Web site, and http://docs.hp.com delivery mechanisms. Conversion from MS Word to Framemaker 6.0 to meet Section 508 compliance. Enhanced graphics and illustrations added.

1 HP Blade Server bh7800 Overview

The HP Blade Server bh7800 provides customers with a single chassis that can house up to 16 functionally separate servers, controlled by one management blade. The form factor for all the blades uses the CompactPCI standard. The chassis mounts in a standard 19-inch EIA rack, in either a two column or four

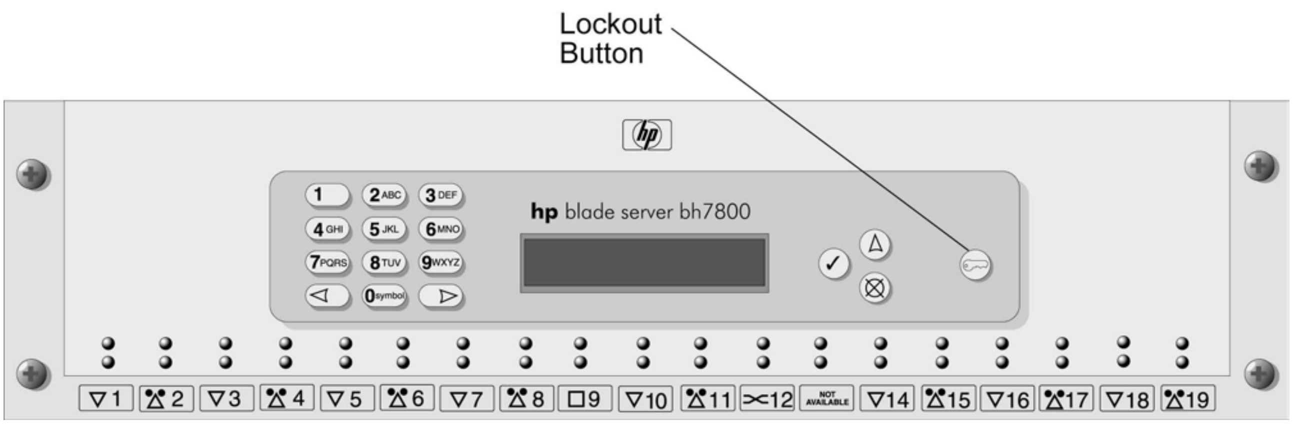
column style rack. Hewlett-Packard Company offers kits for either type rack. The chassis provides slots in the front and rear for installation of server blades, and network blades. Each side accommodates 18 blades and can house up to eight server blades per side.

This chapter provides a high level overview of the various components that comprise the blade server. It is not the intention of this chapter to cover how to operate the blade server.

Display Panel

The bh7800 display panel provides the controls and indicators commonly used when operating the bh7800. There are two LCD display assemblies on the bh7800. Remote control over a network is another method used to operate the bh7800. One display is in the front, just above the card cage. The other is in the rear, just above the card cage. Both show identical data and are visible regardless of which side of the product you are on. The rear display assembly is hinged so that it can be lifted up out of the way for access to the hot swap fan modules. The LCD display panels allow most initialization and system monitoring functions to be performed without connecting via Telnet or directly connecting to the management blade's serial port. The display panel is shown in Figure 1-1.

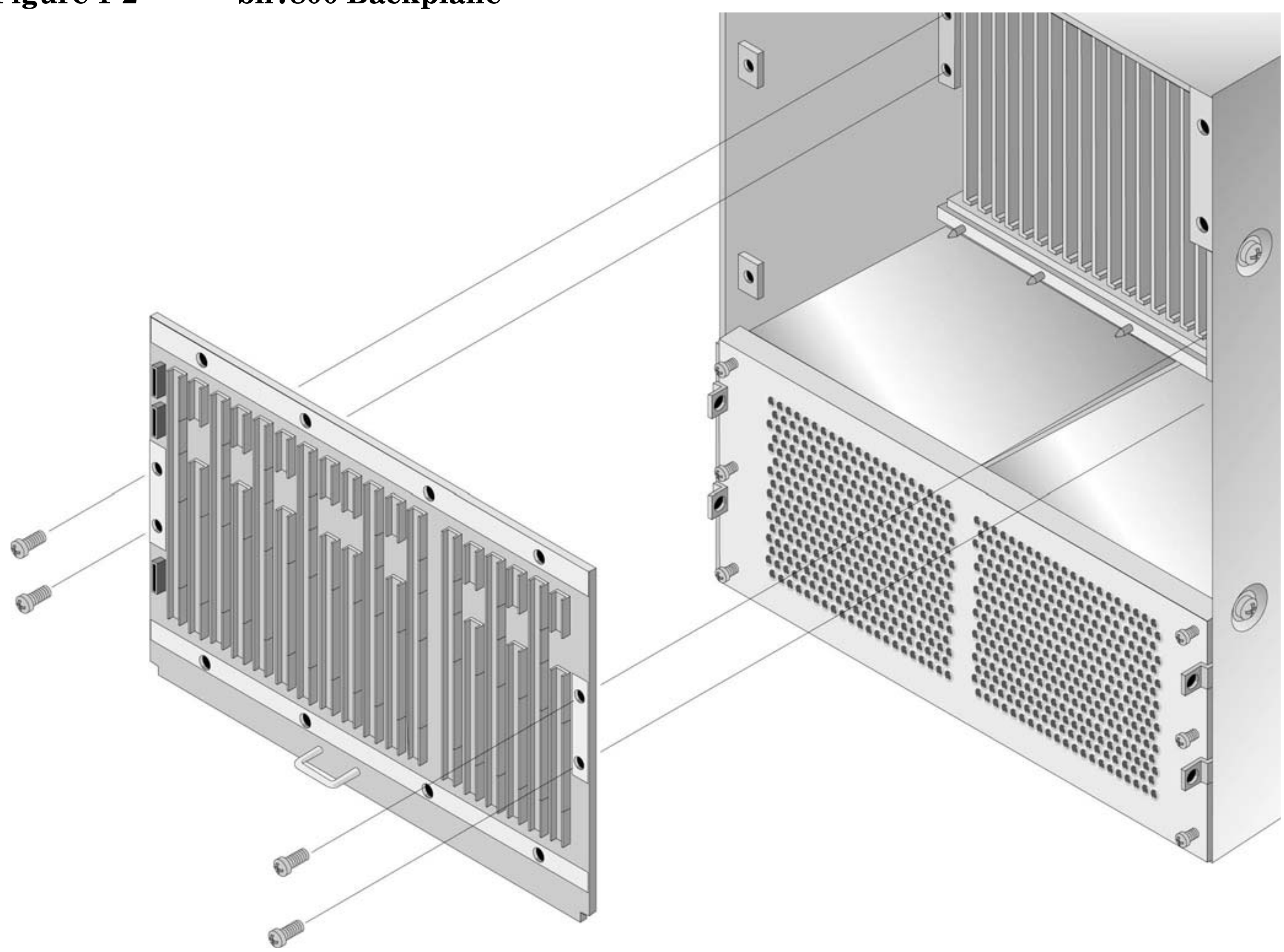
Figure 1-1 LCD Display Panel



System Backplane

The passive system backplane is centrally located in the bh7800 to accommodate front and rear card cages. 18 CompactPCI slots are available on each side with up to five connectors per slot. For the CompactPCI standard, the lower two connectors are used for CompactPCI standard connections, and the upper three connectors are for custom user applications. Additionally, the rear of the backplane has four power connections (two for each power supply). The front of the backplane also contains the fan harness connector and two LCD display cable connections. All connectors used on the backplane are press-fit. No special tool is needed to insert or remove the connectors.

Figure 1-2 bh7800 Backplane



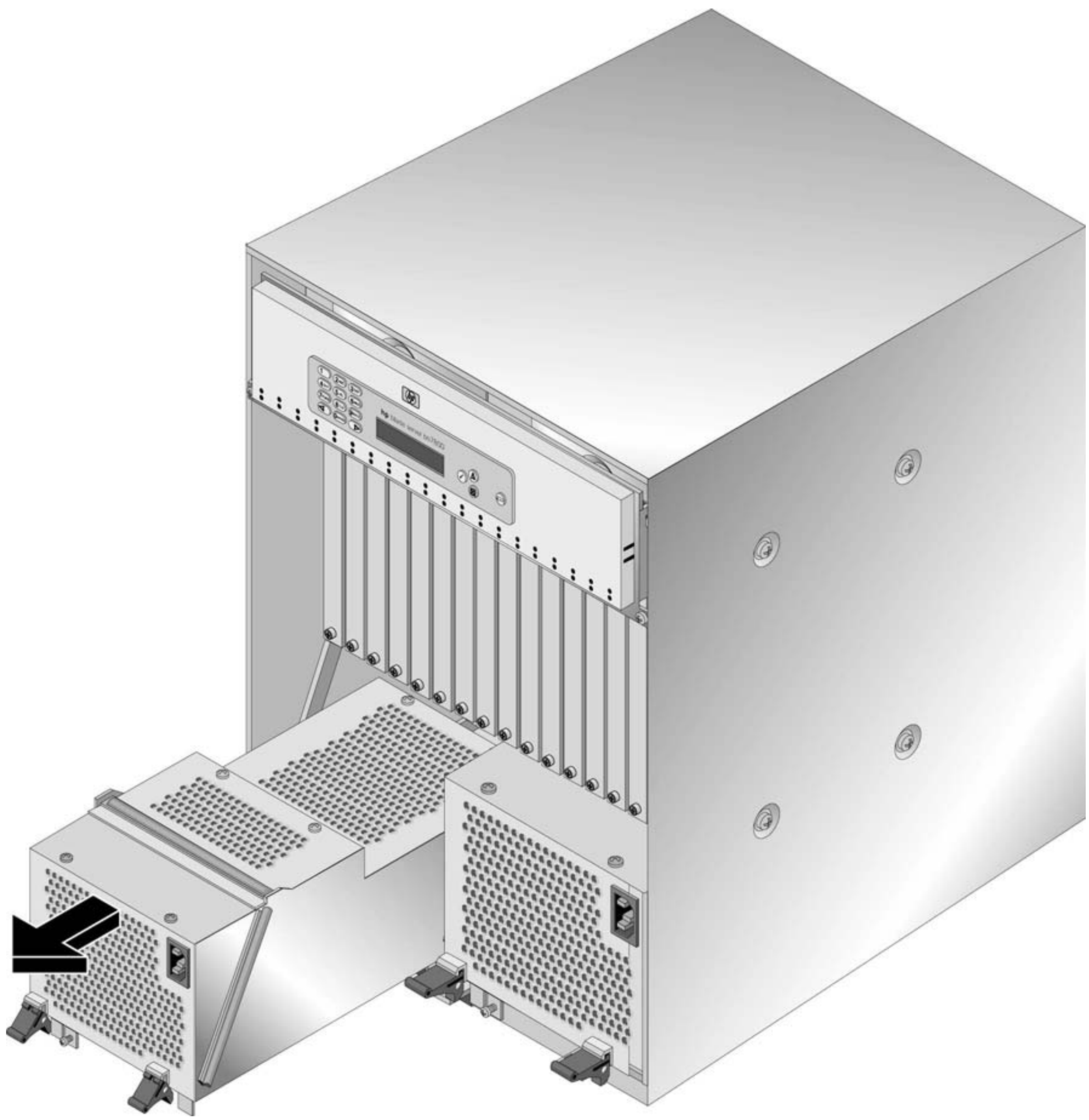
Power Supplies

Each power supply uses two DC connectors that plug into the backplane, and an AC connector brings line power into the unit.   Two power supplies and two power cords ship with the system.

Each supply contains an internal fan for cooling. In the rear of each supply are two insertion/extraction handles and latch assemblies for ease of inserting or removing each power supply. Two captive screws secure each power supply to the system chassis.

A solid green LED indicates normal operation for either power supply. A solid yellow LED indicates a power supply failure. Power supplies are hot swappable.

Figure 1-3 bh7800 Power Supplies (Chassis Rear View)

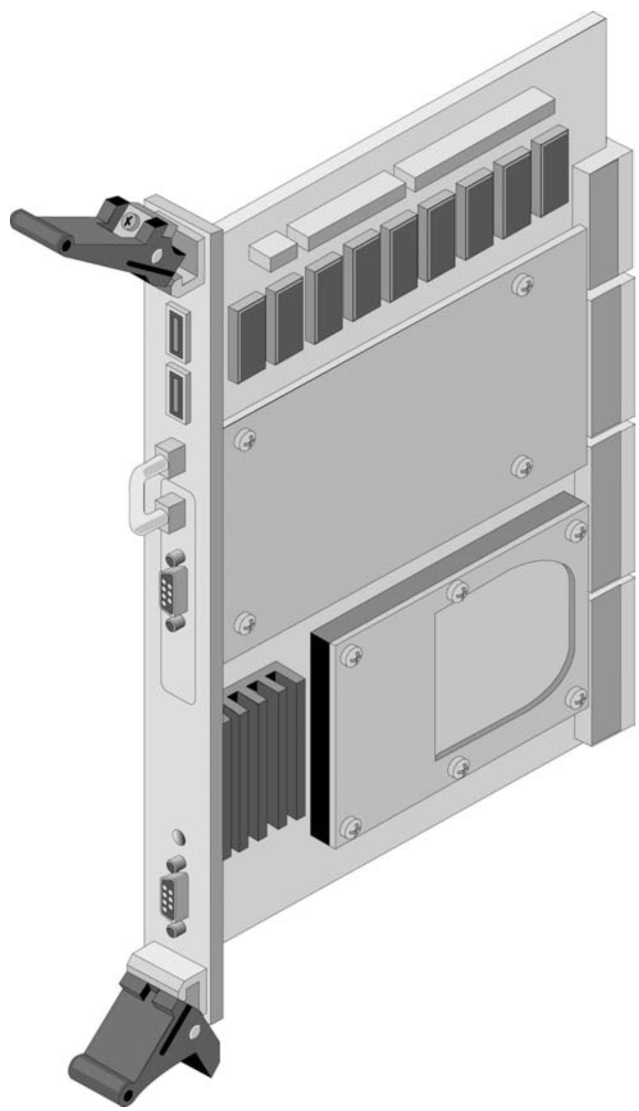


HP Server bc1100

Up to 16 1 slot IA-32 server blades can be inserted in the bh7800 chassis. The 1 slot, 1way IA-32 blade server is a self-contained system. It includes all memory, processor, firmware, I/O adapters, and core I/O required to install the operating system. The board is CompactPCI and hot plug compliant and operates as a CompactPCI master in the host slot. It is also Network Equipment Building Standards (NEBS) compliant. Some I/O connections will be driven through the backplane and some local connections will be available from the front panel.

A daughter board known as the Remote Management Card (RMC) provides LAN-based system console access as well as remote system management functions. LAN-based access to the system console via Telnet is provided to initially configure parameters stored in firmware on the blade. Remote system management functions include power, reboot and inventory control.

Figure 1-4 HP Server bc1100



Network Blade

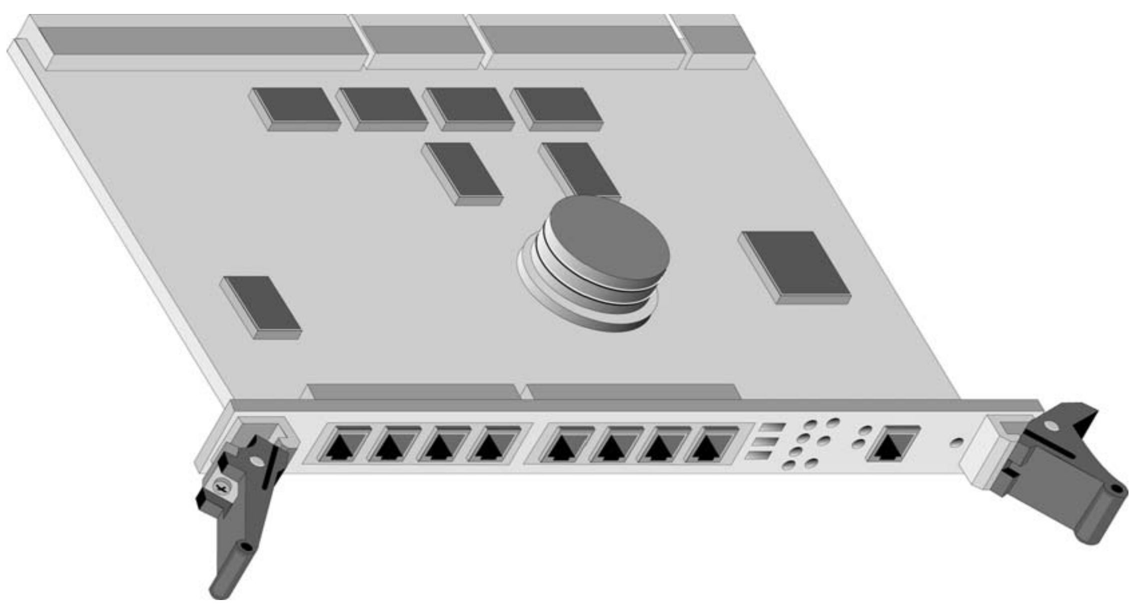
The network blade is a 24-port 10/100 switch with a gigabit uplink connection. The blade provides 16 of the 24 ports to the backplane, and 8 remaining ports out to the bulkhead. In addition, the network blade comes in three uplink options: Tx (copper), Sx (short-wave optical), or Lx (long-wave optical).

The bh7800 system must contain one network blade, but can optionally contain two. The backplane actually contains two separate LANs, LAN-A and LAN-B, so that a second blade provides backup protection for the LAN segment.

The uplink connection aggregates all communications in the bh7800. This gigabit connection aggregates the traffic from all 16 ports.

The blade may be hot swapped without taking down a live system. Of course, if only one switch is in the cabinet, all external communications cease while the blade is being swapped. With a second switch in the chassis, external communications are only interrupted on the LAN connected to the corresponding switch being hot swapped. The switch in front slot 12 corresponds to LAN-A and the switch in rear slot 13 corresponds to LAN-B.

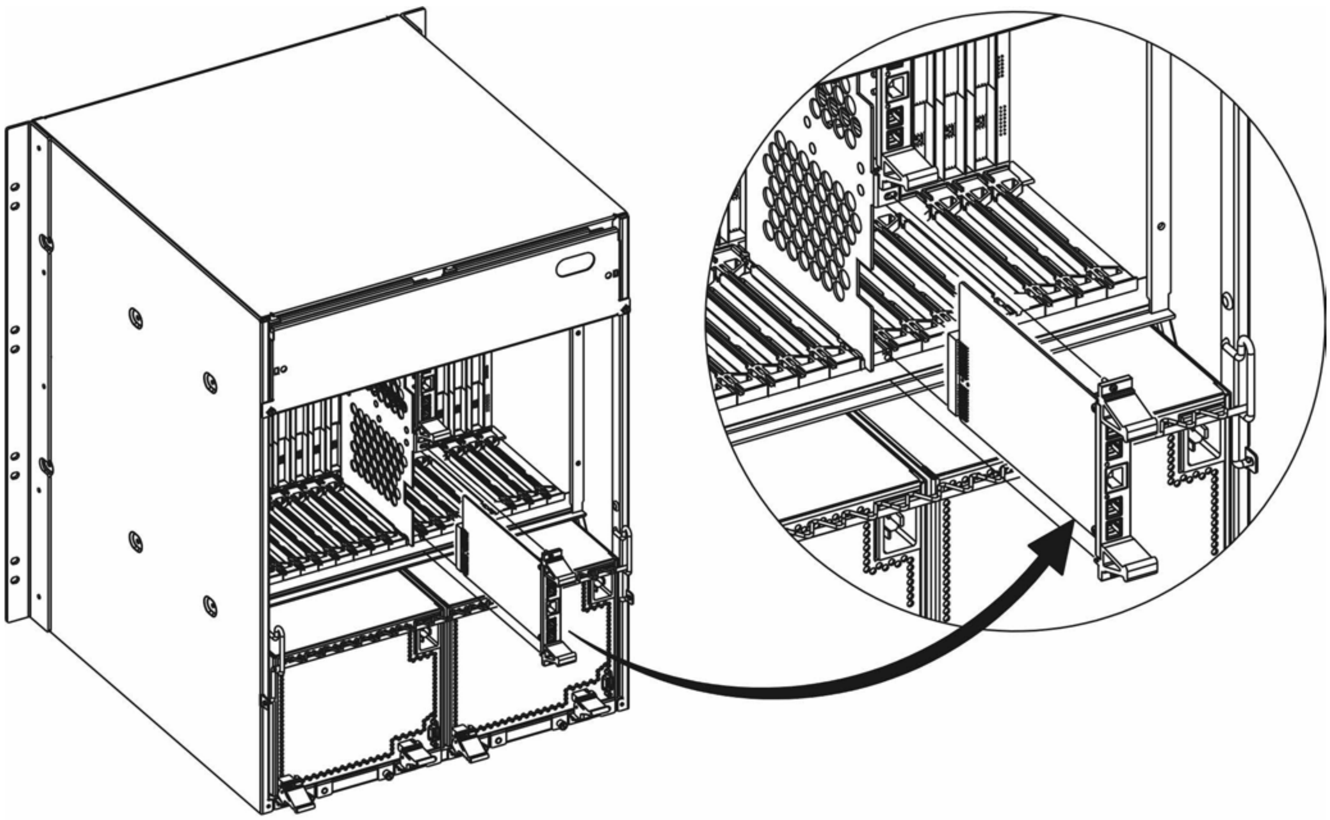
Figure 1-5 Network Blade



Management LAN Blade

The two Rear Transition Modules (RTMs) are unique in the bh7800 product. The RTM is a pseudo standard CompactPCI solution. Each RTM is a 3U blade rather than a 6U blade. CompactPCI card format and the bulkhead is not a CompactPCI standard. A custom carrier holds each PCA in the bh7800 backplane. The custom card guide is inserted in a dedicated location in the rear card cage. The RTM is more commonly referred to as the management LAN blade.

Figure 1-6 Management LAN Blade (shown with carrier)

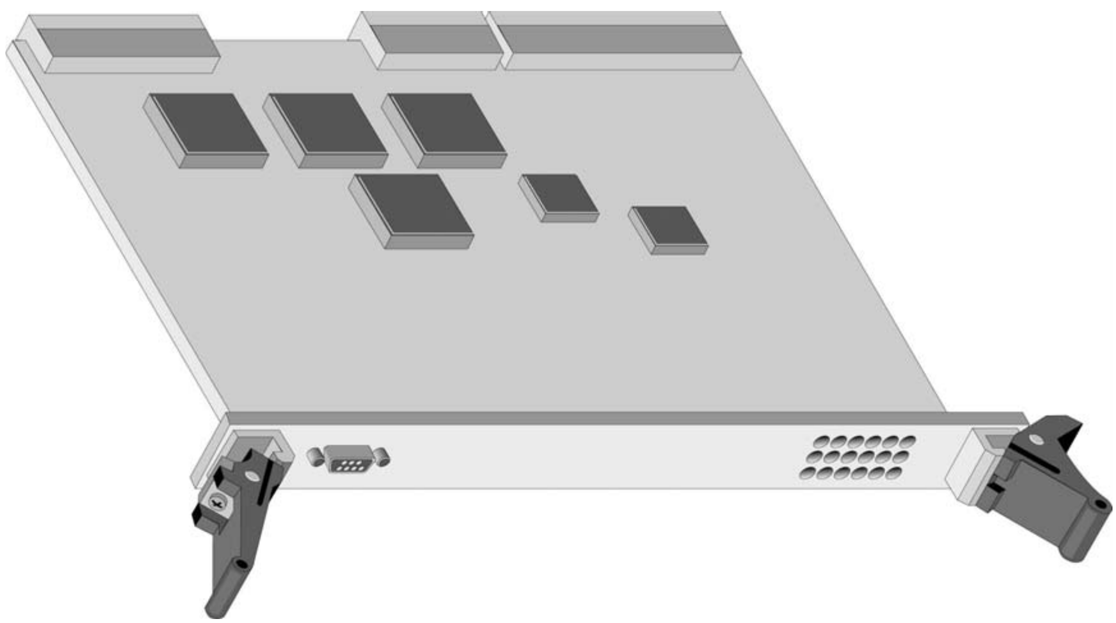


Management Blade

The bh7800 includes a management blade that allows remote and local management of the individual server and network blades. The blade monitors the chassis environment such as power, temperature, and overall server blade health. The blade can be accessed via a serial connection on the chassis or it can be accessed via the control and management LAN.

The blade provides management support for the console LAN management signals. Provision for control of the console LAN management signals for the sixteen IA-32 server blades or two LAN switches is in the 38 slot chassis.

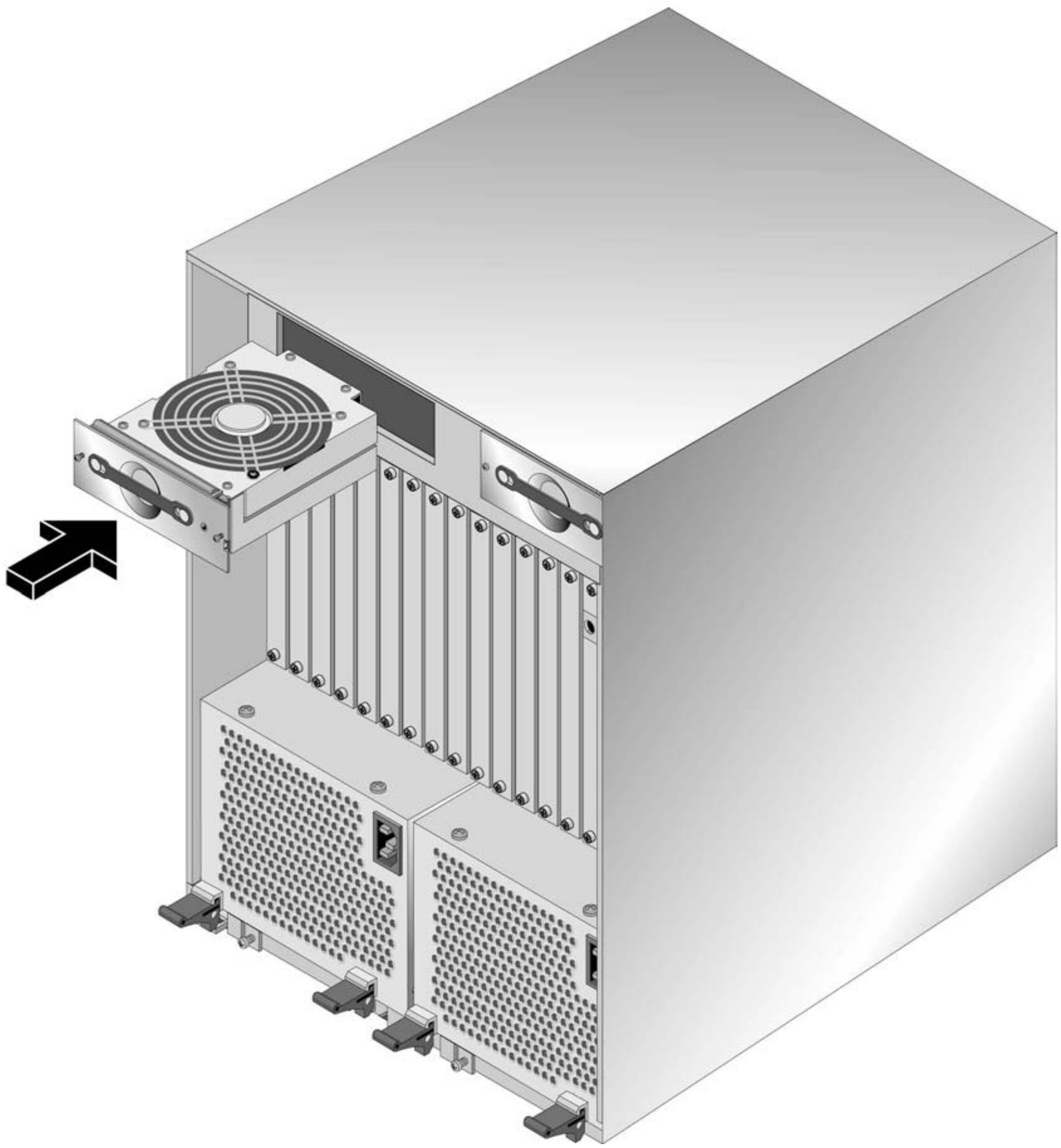
Figure 1-7 Management Blade



Fan Modules

There are two fan module assemblies in the bh7800. They are hot swap modules. Each fan module has an LED to indicate fan failure. Also, each fan can go into the fan module only one way due to the length and location of the fan cable with its blind mate connector. Once each fan module is securely seated in the chassis, two screws are tightened to secure each fan and prevent it from backing out of the chassis due to vibration.

Figure 1-8 bh7800 Fan Assemblies

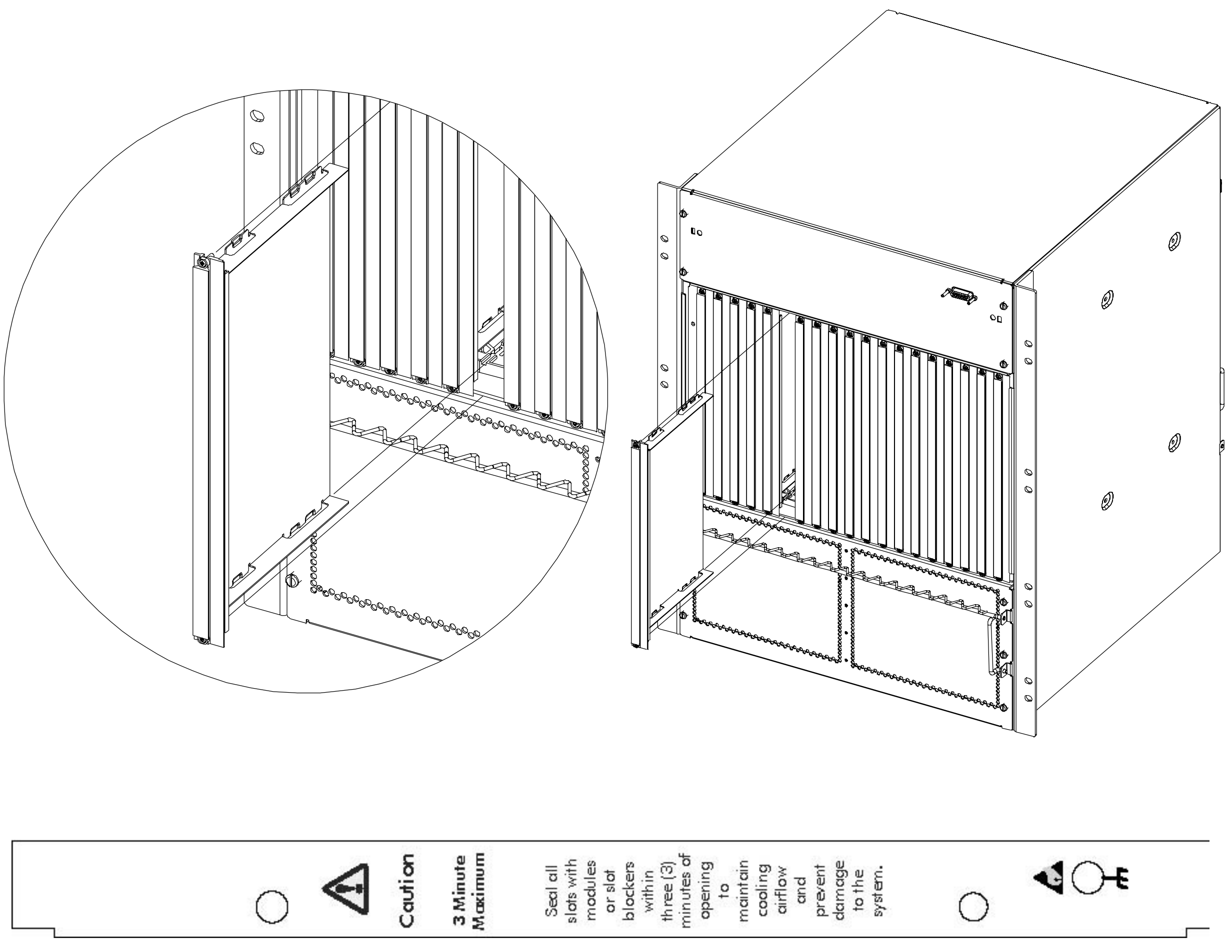


Slot Blocker Assembly

The bh7800 uses a closed, pressurized cooling system. Fans draw air in the bottom at the front of the chassis, direct it upwards across the front blades, over the top of the backplane, downwards over the rear blades and into the power supplies where it exits out the back of the bh7800.

Any slot that isn't occupied by a blade must contain a slot blocker to channel cool air in the proper direction to maintain the cooling system pressure. A caution label on the chassis (bottom figure) indicates how serious this requirement is.

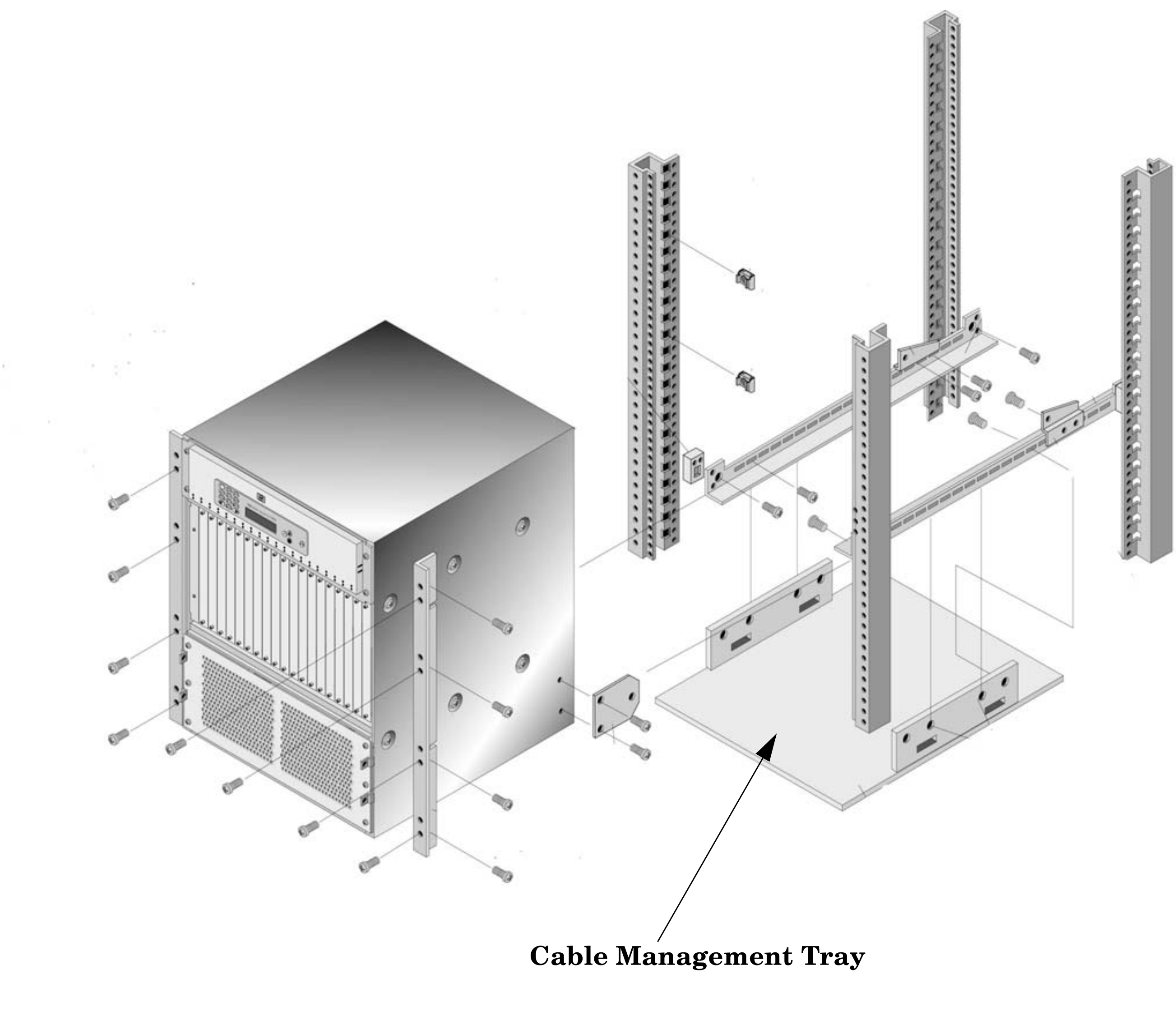
Figure 1-9 bh7800 Caution Label shown with Slot Blocker Assembly



Cable Management Tray

The ½ EIA unit high (1/2U) cable management tray provides a channel for cables and helps prevent the accidental disconnection of cables from their respective blades. The tray is provided for HP Rack System/E four post cabinets, Nortel four post cabinets and Chatsworth two post cabinets. The tray allows data cables to be securely attached to the chassis and to maintain the critical bend radius associated with high speed data cables.

Figure 1-10 bh7800 Racking for HP Rack System/E Cabinet Showing Cable Tray

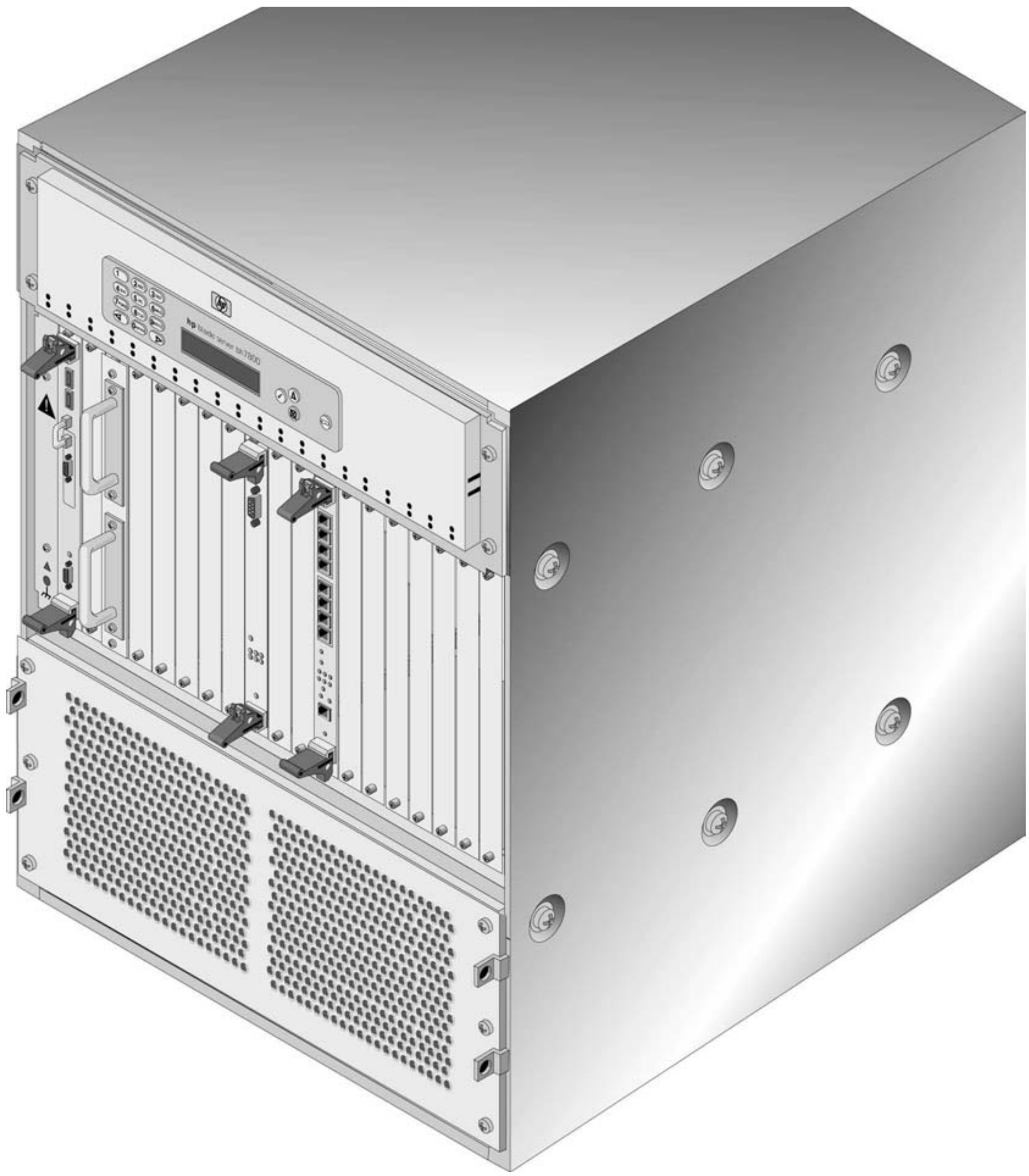


Front View

The components available at the front of this 13 EIA unit high (13U) server are

- Eighteen individual CompactPCI slots supporting defined configurations for 1 slot and 2 slot PCA's
- One front LCD display panel
- The system backplane is removable from the front and is centrally located in the chassis
- Front cable management bracket (not shown)

Figure 1-11 bh7800 Front View

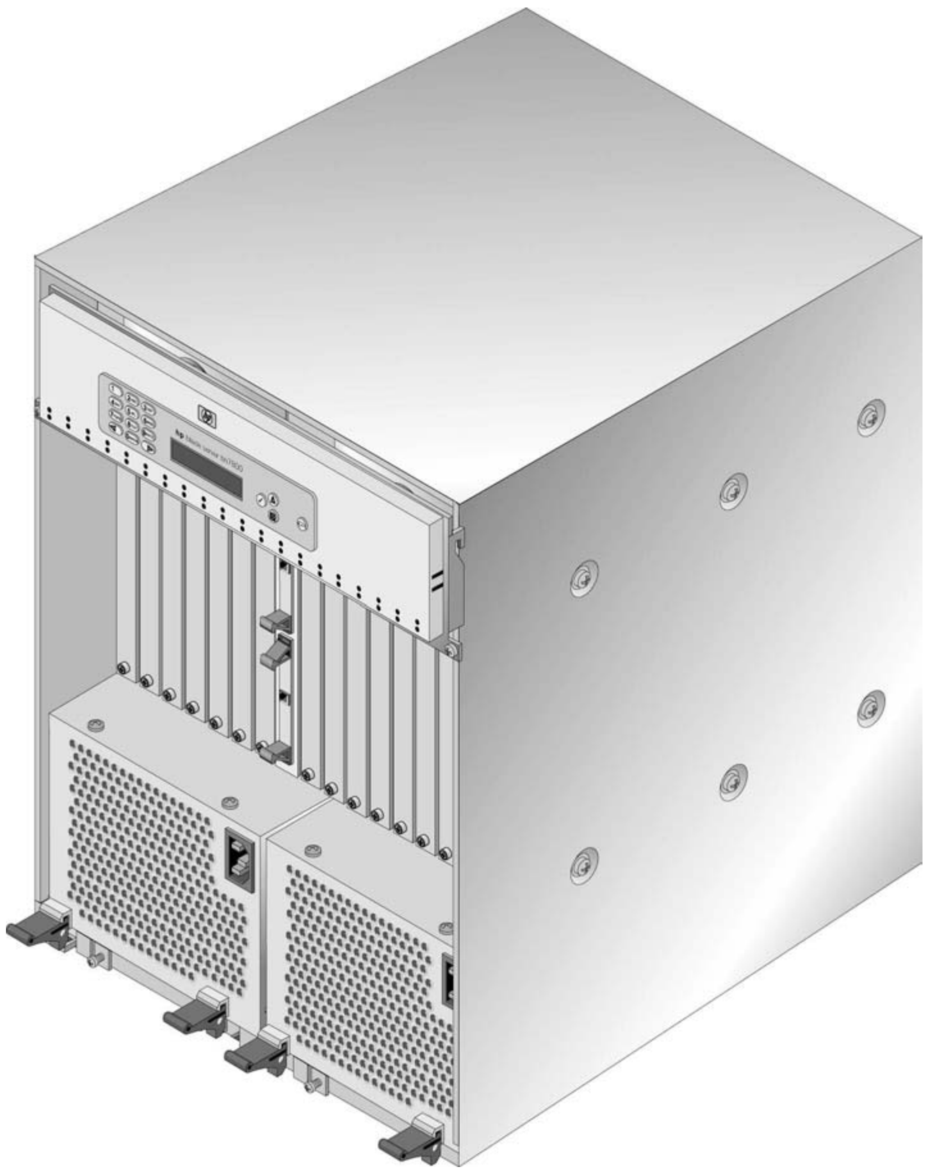


Rear View

The components available at the rear of this 13 EIA unit high (13U) server are

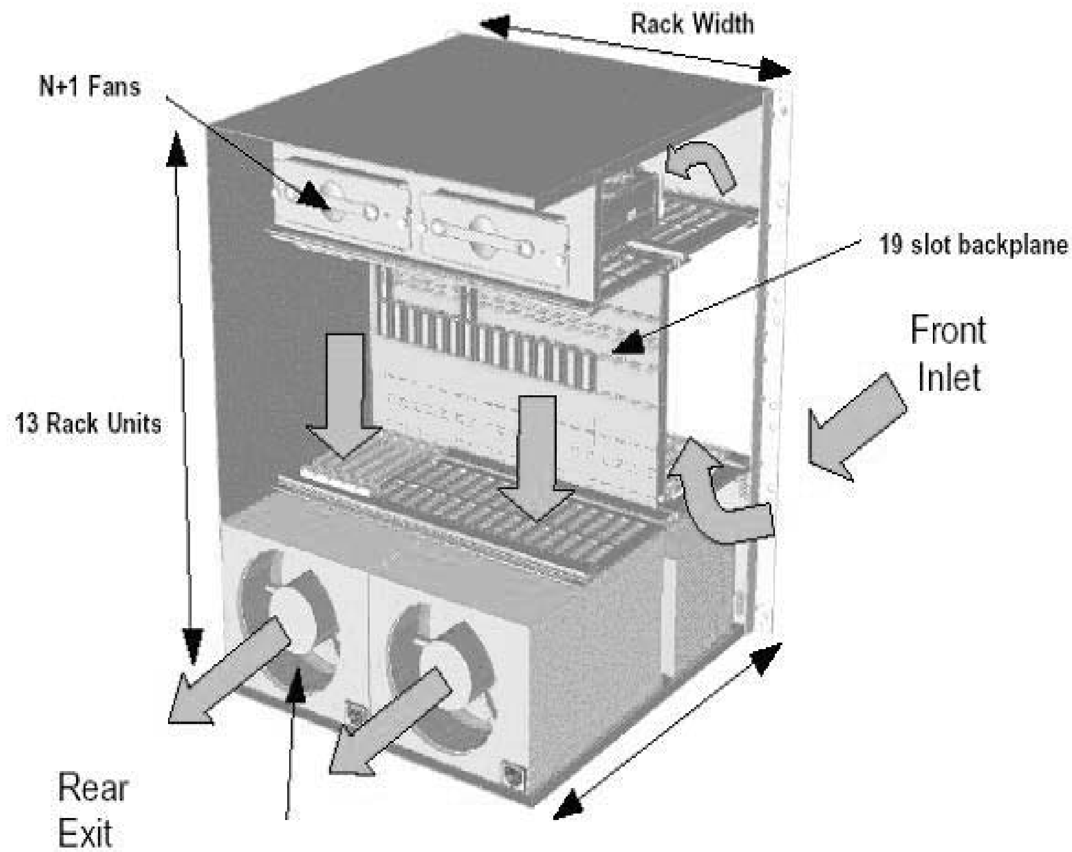
- Two hot swap N+1 power supplies
- Two hot swap N+1 fan modules (hidden behind the rear panel display)
- Eighteen individual CompactPCI slots supporting defined configurations for 1 slot and 2 slot PCAs.
- One rear LCD display panel
- Rear cable management bracket (not shown)

Figure 1-12 bh7800 Rear View



Air Flow

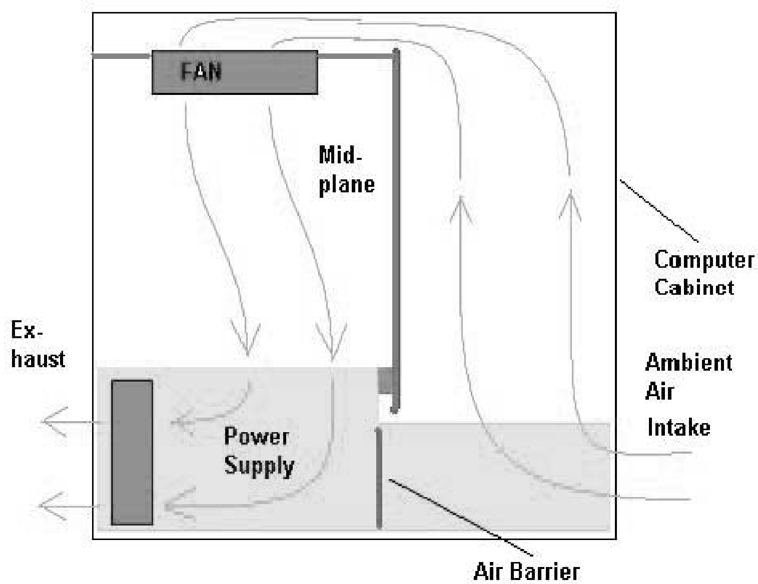
Figure 1-13 bh7800 Cooling Airflow (Chassis Rear View)



The bh7800 utilizes a front to back cooling scheme. Four 150mm diameter 48V DC fans cool the system, one in each power supply and two in independent carriers. Refer to Appendix A for System Specifications. Air enters the vent along the lower front surface of the chassis and passes through the front sections of the power

supplies and up through the front card cage. Air then passes over the top of the backplane, through the top rear fans and down through the rear card cage. It travels through the rear sections of the power supplies and out through the rear power supply fans.

Figure 1-14 bh7800 Cooling Airflow (Chassis Side View)



Air Intake Temperature

The recommended air intake temperature for the bh7800 server is between 68 degrees F and 77 degrees F (25 degrees C and 30 degrees C) at 225 CFM.

Shipping Dimensions and Weights

Table 1-1 lists the dimensions and weights of the bh7800 server with the shipping pallet.

Table 1-1 bh7800 Server Weights and Dimensions as Shipped on a Pallet

Equipment	Width (cm)	Depth/Length (cm)	Height (cm)	Weight (kg)
bh7800 server on shipping pallet[a][b]	21.25 inches (53.98 cm)	30.50 inches (77.47 cm)	29.38 inches (74.63 cm)	203 lbs (92.08 kg)

a. Shipping box, pallet and container add approximately 23 lbs to the total system weight.
b. Specifications given in Table 1-1 are for a fully configured system.

2 General System and Facility Guidelines

This chapter provides general computer facility guidelines for planning and preparing the site. Careful site planning and preparation ensures trouble-free installation and reliable operation of HP servers. Factors that may contribute to less than optimal equipment operation are also highlighted. Refer to Appendix A for more information on guidelines specific to the bh7800.

Electrical Factors

NOTE Electrical practices and suggestions in this guide are based on North American practices. For countries and areas outside North America, local electrical codes will take precedence over North American electrical codes.

An example would be the recommendation that the PE (protective earthing) conductor be green with yellow stripes. This requirement is a North American directive and does not override the local code requirements for a country or area outside North America.

Local Authority Has Jurisdiction (**LAHJ**) and should make the final decision regarding adherence to country-specific or area-specific electrical codes and guidelines.

Throughout this chapter, the **LAHJ** acronym will be used to indicate Local Authority Has Jurisdiction.

Proper design and installation of a power distribution system for a HP server requires specialized skills. Those responsible for this task must have a thorough knowledge and understanding of appropriate electrical codes and the limitations of the power systems for computer and data processing equipment.

In general, a well-designed power distribution system exceeds the requirements of most electrical codes. A good design, when coupled with proper installation practices, produces the most trouble-free operation.

A detailed discussion of power distribution system design and installation is beyond the scope of this document. However, electrical factors relating to power distribution system design and installation must be considered during the site preparation process.

The electrical factors discussed in this section are:

- Electrical load requirements (circuit breaker sizing)
- Power quality
- Distribution hardware
- Grounding Systems
- System installation guidelines

Electrical Load Requirements (Circuit Breaker Sizing) LAHJ

Appendix A summarizes electrical power load (KVA input) requirements for this server but additional capacity should be added for equipment upgrading or expansion.

It is a good practice to derate power distribution systems for one or more of the following reasons:

- Circuit protection devices should be rated at 20% above the systems root-mean-square (RMS) current ratings to avoid nuisance tripping from load shifts or power transients.
- Safety agencies derate most power connectors to 80% of their RMS current ratings.

Power Quality

HP equipment is designed to operate over a wide range of voltages and frequencies. However, damage can occur if these ranges are exceeded. Severe electrical disturbances can exceed the design specifications of the equipment.

Sources of Voltage Fluctuations

Voltage fluctuations, sometimes called glitches, affect the quality of electrical power. Common sources of these fluctuations are:

- Fluctuations occurring within the facility's distribution system
- Utility service low-voltage conditions (such as sags or brownouts)
- Wide and rapid variations in input voltage levels
- Wide and rapid variations in input power frequency
- Electrical storms
- Large inductive sources (such as motors and welders)
- Faults in the distribution system wiring (such as loose connections)
- Microwave, radar, radio, or cell phone transmissions

Power System Protection

Computer systems can be protected from the sources of many of these electrical disturbances by using:

- A dedicated power distribution system
- Power conditioning equipment
- Over- and under-voltage detection and protection circuits
- Screening to cancel out the effects of undesirable transmissions
- Lightning arresters on power cables to protect equipment against electrical storms

Precautions have been taken during power distribution system design to provide immunity to power outages of less than one cycle. However, testing cannot conclusively rule out loss of service. Therefore, adherence to the following guidelines provides the best possible performance of power distribution systems for HP server equipment:

- Dedicated power source—Isolates server power distribution system from other circuits in the facility.
- Missing-phase and low-voltage detectors—Shuts equipment down automatically when a severe power disruption occurs. For peripheral equipment, these devices are recommended but optional.
- Online Uninterruptible Power Supply (UPS)—Keeps input voltage to devices constant and should be considered if outages of one-half cycle or more are common.

Refer to qualified contractors or consultants for each situation.

Distribution Hardware

This section describes wire selection and the types of raceways (electrical conduits) used in the distribution system.

Wire Selection

Use copper conductors instead of aluminum, as aluminum's coefficient of expansion differs significantly from that of other metals used in power hardware. Because of this difference, aluminum conductors can cause connector hardware to work loose, overheat, and fail.

Raceway Systems (Electrical Conduits) LAHJ

Raceways (electrical conduits) form part of the protective ground path for personnel and equipment. Raceways protect the wiring from accidental damage and also provide a heatsink for the wires.

Any of the following types may be used:

- Electrical Metallic Tubing (EMT) thin-wall tubing
- Rigid (metal) conduit
- Liquidtight with RFI shield grounded (most commonly used under raised floors)

Building Distribution

All building feeders and branch circuitry should be in rigid metallic conduit with proper connectors (to provide ground continuity). Conduit that is exposed and subject to damage should be constructed of rigid galvanized steel.

Grounding Systems

Power Distribution Safety Grounding LAHJ

The power distribution safety grounding system consists of connecting various points in the power distribution system to earth ground using green (green/yellow) wire ground conductors. Having these ground connections tied to metal chassis parts that may be touched by computer room personnel protects them against shock hazard from current leakage and fault conditions.

Power distribution systems consist of several parts. Hewlett-Packard recommends that these parts be solidly interconnected to provide an equipotential ground to all points.

Main Building Electrical Ground

The main electrical service entrance equipment should have an earth ground connection, as required by applicable codes. Connections such as a grounding rod, building steel, or a conductive type service pipe provide an earth ground.

Electrical Conduit Ground

All electrical conduits should be made of rigid metallic conduit that is securely connected together or bonded to panels and electrical boxes, so as to provide a continuous grounding system.

Power Panel Ground

Each power panel should be grounded to the electrical service entrance with green (green/yellow) wire ground conductors. The green (green/yellow) wire ground conductors should be sized per applicable codes (based on circuit over current device ratings).

NOTE The green wire ground conductor mentioned above might be a black wire marked with green tape. **LAHJ**

Computer Safety Ground

Ground all computer equipment with the green (green/yellow) wire included in the branch circuitry. The green (green/yellow) wire ground conductors should be connected to the appropriate power panel and should be sized per applicable codes (based on circuit over current device ratings).

Dual Power Source Grounding

When dual power sources are utilized, strong consideration should be given to measure voltage potentials. The use of dual power might create an electrical potential that can be hazardous to personnel and might cause performance issues for the equipment.

Dual power sources might originate from two different transformers or two different UPS devices. Voltage potentials from ground pin to ground pin of these sources should be measured and verified to be at or near 0.0 volts. Voltage levels that deviate or are measured above 3.0 volts should be further investigated. Increased voltages might be hazardous to personnel, and should be further investigated.

Cabinet Performance Grounding (High Frequency Ground)

Signal interconnects between system cabinets require high frequency ground return paths. Connect all cabinets to site ground.

NOTE In some cases power distribution system green (green/yellow) wire ground conductors are too long and inductive to provide adequate high frequency ground return paths. Therefore, a ground strap (customer-supplied) should be used for connecting the system cabinet to the site-grounding grid (customer-supplied). When connecting this ground, ensure that the raised floor is properly grounded for high frequency.

Power panels located in close proximity to the computer equipment should also be connected to site grounding grid. Methods of providing a sufficiently high frequency ground grid are described in the next sections.

Raised Floor “High Frequency Noise” Grounding

If a raised floor system is used, install a complete signal-grounding grid for maintaining equal potential over a broad band of frequencies. The grounding grid should be connected to the equipment cabinet and electrical service entrance ground at multiple connection points using a minimum #6 AWG ($16mm^2$) wire ground conductor. Figure 2-1 illustrates a metallic strip grounding system.

NOTE Regardless of the grounding connection method used, the raised floor should be grounded as an absolute safety minimum.

Hewlett-Packard recommends the following approaches:

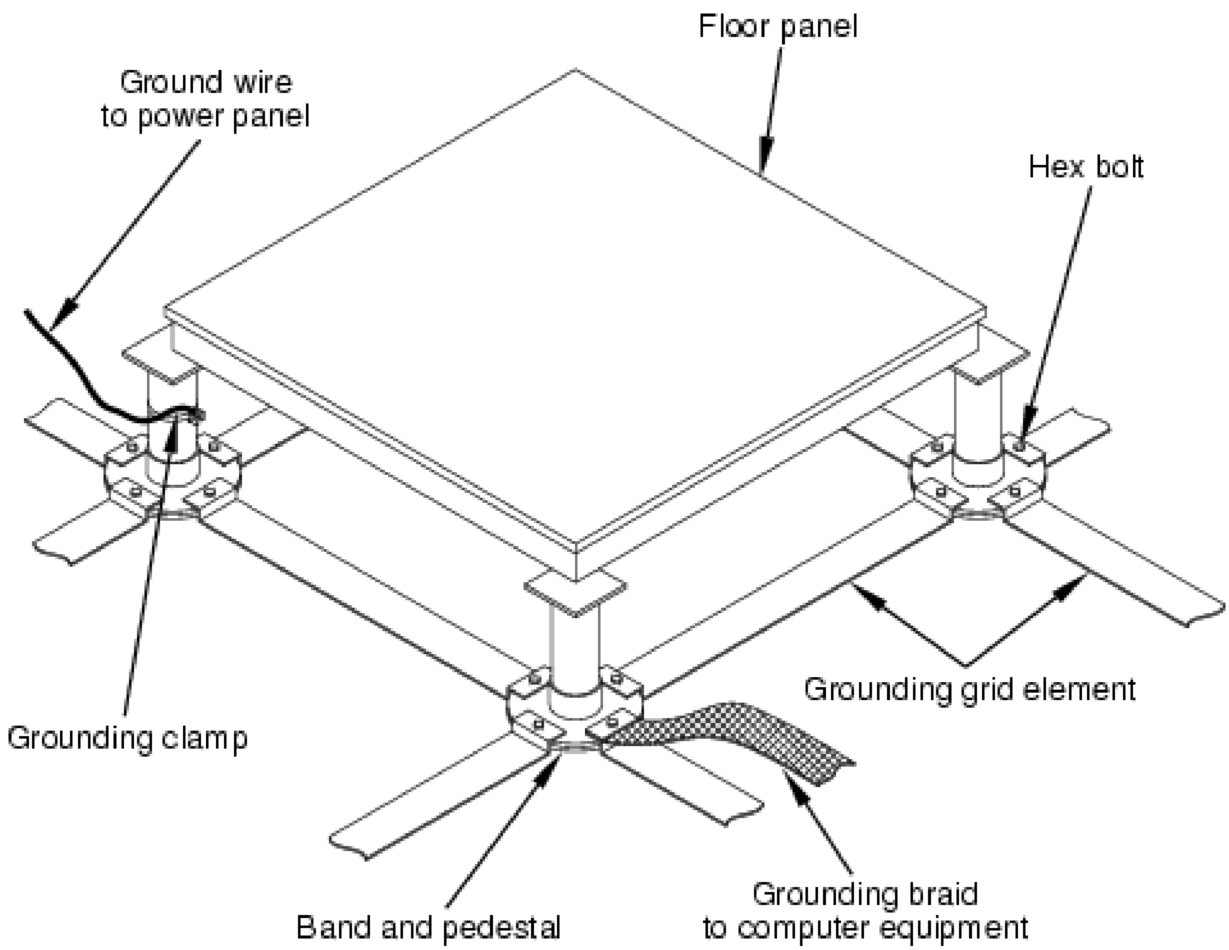
- Excellent - Add a grounding grid to the subfloor. The grounding grid should be made of copper strips mounted to the subfloor. The strips should be 0.032 in. (0.08 cm) thick and a minimum of 3.0 in. (8.0 cm) wide. Connect each pedestal to four strips using 1/4 in. (6.0 mm) bolts tightened to the manufacturer’s torque recommendation.
- Better - A grounded #6 AWG minimum copper wire grid mechanically clamped to floor pedestals and properly bonded to the building/site ground.
- Good - Use the raised floor structure as a ground grid. In this case, the floor must be designed as a ground grid with bolted down stringers and corrosion resistive plating (to provide low resistance and attachment points for connection to service entrance ground and HP server equipment). The use of conductive floor tiles with this style of grid further enhances ground performance. The structure needs to be mechanically bonded to a known good ground point.

Equipment Grounding Implementation Details

Connect all Hewlett-Packard equipment cabinets to the site ground grid as follows:

1. Attach one end of each ground strap to the applicable cabinet ground lug.
2. Attach the other end to the nearest pedestal base (raised floor) or cable trough ground point (nonraised floor).
3. Check that the braid contact on each end of the ground strap consists of a terminal and connection hardware (a 1/4-in. (6.0 mm) bolt, nuts, and washers).
4. Check that the braid contact connection points are free of paint or other insulating material and treated with a contact enhancement compound (similar to Burndy Penetrox).

Figure 2-1 Raised Floor Metal Strip Ground System



System Installation Guidelines

This section contains information about installation practices. Some common pitfalls are highlighted. Wiring connections and data communications cable installations are discussed.

NOTE In domestic installations, the proper receptacles should be installed prior to the arrival of Hewlett-Packard equipment. Refer to the appropriate installation guide for installation procedures.

Wiring Connections

Expansion and contraction rates vary among different metals. Therefore, the integrity of an electrical connection depends on the restraining force applied. Connections that are too tight, compress or deform the hardware and cause it to weaken. This usually leads to high impedance preventing circuit breakers from tripping when needed or can contribute to a buildup of high frequency noise.

CAUTION Connections that are too loose or too tight can have a high impedance that cause serious problems, such as erratic equipment operation. A high impedance connection overheats and sometimes causes fire or high temperatures that can destroy hard-to-replace components such as distribution panels or system bus bars.

Wiring connections must be properly torqued. Many equipment manufacturers specify the proper connection torque values for their hardware.

Ground connections must only be made on a conductive, nonpainted surface. When equipment vibration is present, lock washers must be used on all connections to prevent connection hardware from working loose.

Data Communications Cables

Power transformers create high-energy fields in the form of electromagnetic interference (EMI). Heavy foot traffic can create electrostatic discharge (ESD) that can damage electronic components. Route data communications cables away from these areas. Use shielded data communications cables that meet approved industry standards to reduce the effects of external fields.

Environmental Factors

The environmental factors discussed in this section are:

- Computer Room Preparation
- Space Requirements
- Floor Loading
- Cooling Requirements
- Air Conditioning Ducts
- Humidity Level
- Dust and Pollution Control
- Metallic Particulate Contamination
- Electrostatic Discharge (ESD) Prevention
- Acoustics (noise reduction)

Computer Room Preparation

The following guidelines are recommended when preparing a computer room for a HP server.

- Locate the computer room away from the exterior walls of the building to avoid the heat gain from windows and exterior wall surfaces.
- When exterior windows are unavoidable, use windows that are double or triple glazed and shaded to prevent direct sunlight from entering the computer room.
- Maintain the computer room at a positive pressure relative to surrounding spaces.
- Use a vapor barrier installed around the entire computer room envelope to restrain moisture migration.
- Caulk and vapor seal all pipes and cables that penetrate the envelope.
- Use at least a 12-inch raised floor for minimum favorable room air distribution system (underfloor distribution).
- Ensure a minimum clearance of 12 inches between the top of the server cabinet and the ceiling to allow for return airflow and ensure that all ceiling tiles are in place.
- Allow 18 inches (or local code minimum clearance) from the top of the server cabinet to the fire sprinkler heads.

Space Requirements

This section contains information about space requirements for a HP server. This data should be used as the basic guideline for space plan developments. Other factors, such as airflow, lighting, and equipment space requirements must also be considered.

Delivery Space Requirements

There should be enough clearance to move equipment safely from the receiving area to the computer room. Permanent obstructions, such as pillars or narrow doorways, can cause equipment damage.

Delivery plans should include the possible removal of walls or doors. The physical dimensions for applicable computers and peripheral equipment are summarized in Appendix A.

Operational Space Requirements

Other factors must be considered along with the basic equipment dimensions. Reduced airflow around equipment causes overheating, which can lead to equipment failure. Therefore, the location and orientation of air conditioning ducts, as well as airflow direction, are important. Obstructions to equipment intake or exhaust airflow must be eliminated.

The locations of lighting fixtures and utility outlets affect servicing operations. Plan equipment layout to take advantage of lighting and utility outlets. Do not forget to include clearance for opening and closing equipment doors.

Clearance around and above the cabinets must be provided for proper cooling airflow through the equipment.

The service area space requirements, outlined in Appendix A, are minimum dimensions. If other equipment is located so that it exhausts heated air near the cooling air intakes of the computer system cabinets, larger space requirements are needed to keep ambient air intake to the computer system cabinets within the specified temperature and humidity ranges.

Space planning should also include the possible addition of equipment or other changes in space requirements. Equipment layout plans should also include provisions for the following:

- Channels or fixtures used for routing data cables and power cables
- Access to air conditioning ducts, filters, lighting, and electrical power hardware
- Power conditioning equipment
- Cabinets for cleaning materials
- Maintenance area and spare parts

Floor Plan Grid

A floor plan grid is helpful for planning the location of equipment in the computer room. In addition to its use for planning, a floor plan grid should also be considered when planning the locations of the following items:

- Air conditioning vents
- Lighting fixtures
- Utility outlets
- Doors
- Access areas for power wiring and air conditioning filters
- Equipment cable routing

Floor Loading

The computer room floor must be able to support the total weight of the installed computer system as well as the weight of the individual cabinets as they are moved into position.

Floor loading is usually not an issue in nonraised floor installations. The information presented in this section is directed toward raised floor installations.

NOTE An appropriate floor system consultant should verify any floor system under consideration for a HP server installation.

Raised Floor Loading

Raised floor loading is a function of the manufacturer's load specification and the positioning of the equipment relative to the raised floor grid. While Hewlett-Packard cannot assume responsibility for determining the suitability of a particular raised floor system, it does provide information and illustrations for the customer or local agencies to determine installation requirements.

The following guidelines are recommended:

- Because many raised floor systems do not have grid stringers between floor stands, the lateral support for the floor stands depends on adjacent panels being in place. To avoid compromising this type of floor system while gaining under floor access, remove only one floor panel at a time.
- Larger floor grids (bigger panels) are generally rated for lighter loads.

CAUTION Do not position or install any equipment cabinets on the raised floor system until you have carefully examined it to verify that it is adequate to support the appropriate installation.

Floor Loading Terms

Table 2-1 defines floor-loading terms.

Table 2-1 Floor Loading Terminology

Term	Definition
Dead load	The weight of the raised panel floor system, including the under structure. Expressed in lb/ft^2 (kg/m^2).
Live load	The load that the floor system can safely support. Expressed in lb/ft^2 (kg/m^2).
Concentrated load	The load that a floor panel can support on a one-inch^2 (6.45 cm^2) area at the panel's weakest point (typically the center of the panel), without the surface of the panel deflecting more than a predetermined amount.
Ultimate load	The maximum load (per floor panel) that the floor system can support without failure. Failure expressed by floor panel(s) breaking or bending. Ultimate load is usually stated as load per floor panel.
Rolling load	The load a floor panel can support (without failure) when a wheel of specified diameter and width is rolled across the panel.

Table 2-1 Floor Loading Terminology (Continued)

Term	Definition
Average floor load	Computed by dividing total equipment weight by the area of its footprint. This value is expressed in lb/ft^2 (kg/m^2).

Cooling Requirements

Air conditioning equipment requirements and recommendations are described in the following sections.

Appendix A summarizes air conditioning requirements for this HP server.

Basic Air Conditioning Equipment Requirement

The cooling capacity of the installed air conditioning equipment for the computer room should be sufficient to offset the computer equipment dissipation loads, as well as any space envelope heat gain. This equipment should include:

- Air filtration
- Cooling or dehumidification
- Humidification
- Reheating
- Air distribution
- System controls adequate to maintain the computer room within the specified operating ranges of this HP Server.

Lighting and personnel must also be included. For example, a person dissipates about 450 BTUs per hour while performing a typical computer room task.

Air Conditioning System Guidelines

The following guidelines are recommended when designing an air conditioning system and selecting the necessary equipment:

- The air conditioning system that serves the computer room should be capable of operating 24 hours a day, 365 days a year. It should also be independent of other systems in the building.
- Consider the long-term value of computer system availability, redundant air conditioning equipment or capacity.
- The system should be capable of handling any future computer system expansion.
- Air conditioning equipment air filters should have a minimum rating of 45% (based on “ASHRAE Standard 52-76, Dust Spot Efficiency Test”).
- Introduce only enough outside air into the system to meet building code requirements (for human occupancy) and to maintain a positive air pressure in the computer room.

Air Conditioning System Types

The following three air conditioning system types are listed in order of preference:

- Complete self-contained package unit(s) with remote condenser(s). These systems are available with up or down discharge and are usually located in the computer room.

- Chilled water package unit with remote chilled water plant. These systems are available with up or down discharge and are usually located in the computer room.
- Central station air handling units with remote refrigeration equipment. These systems are usually located outside the computer room.

Basic Air Distribution Systems

A basic air distribution system includes supply air and return air.

An air distribution system should be zoned to deliver an adequate amount of supply air to the cooling air intake vents of the computer system equipment cabinets. Supply air temperature should be maintained within the following parameters:

- Ceiling supply system—From 55 °F (12.8 °C) to 60 °F (15.6°C)
- Floor supply system—At least 60 °F (15.6 °C)

If a ceiling plenum return air system or a ducted ceiling return air system is used, the return air grill(s) in the ceiling should be above the exhaust area or the exhaust row.

The following three types of air distribution system are listed in order of recommendation:

- Underfloor air distribution system—Downflow air conditioning equipment located on the raised floor of the computer room uses the cavity beneath the raised floor as plenum for the supply air.

  Return air from an underfloor air distribution system can be ducted return air (DRA) above the ceiling.

  Perforated floor panels (available from the raised floor manufacturer) should be located around the front of the system cabinets. Supply air emitted though the perforated floor panels is then available near the cooling air intake vents of the computer system cabinets.

- Ceiling plenum air distribution system—Supply air is ducted into the ceiling plenum from upflow air conditioning equipment located in the computer room or from an air-handling unit (remote).

  The ceiling construction should resist air leakage. Place perforated ceiling panels (with down discharge air flow characteristics) around the front of the system cabinets. The supply air emitted downward from the perforated ceiling panels is then available near the cooling air intake vents of the computer system cabinets.

  Return air should be ducted back to the air-conditioning equipment though the return air duct above the ceiling.

- Above ceiling ducted air distribution system—Supply air is ducted into a ceiling diffuser system from upflow air conditioning equipment located in the computer room or from an air-handling unit (remote).

  Return air from an above ceiling ducted air distribution system may be ducted return air (DRA) above the ceiling, or ceiling plenum return air (CPRA).

  Adjust the supply air diffuser system grilles to direct the cooling air downward around the front of the computer system cabinets. The supply air is then available near the cooling air intake vents of the computer system cabinets.

Air Conditioning System Installation

All air conditioning equipment, materials, and installation must comply with any applicable construction codes. Installation of the various components of the air conditioning system must also conform to the air conditioning equipment manufacturer’s recommendations.

Air Conditioning Ducts

Use separate computer room air conditioning ductwork. If it is not separate from the rest of the building, it might be difficult to control cooling and air pressure levels. Ductwork seals are important for maintaining a balanced air conditioning system and high static air pressure. Adequate cooling capacity means little if the direction and rate of air flow cannot be controlled because of poor duct sealing. Also, the ducts should not be exposed to warm air, or humidity levels may increase.

Humidity Level

Maintain recommended humidity level at 40 to 60% RH. High humidity causes galvanic actions to occur between some dissimilar metals. This eventually causes a high resistance between connections, leading to equipment failures. High humidity can also have an adverse affect on some magnetic tapes and paper media.

CAUTION Low humidity contributes to undesirably high levels of electrostatic charges. This increases the electrostatic discharge (ESD) voltage potential. ESD can cause component damage during servicing operations. Paper feed problems on high-speed printers are usually encountered in low-humidity environments.

Low humidity levels are often the result of the facility heating system and occur during the cold season. Most heating systems cause air to have a low humidity level, unless the system has a built-in humidifier.

Dust and Pollution Control

Computer equipment can be adversely affected by dust and microscopic particles in the site environment.

Specifically, disk drives, tape drives, and some other mechanical devices can have bearing failures resulting from airborne abrasive particles. Dust may also blanket electronic components like printed circuit boards causing premature failure due to excess heat and/or humidity build up on the boards. Other failures to power supplies and other electronic components can be caused by metallically conductive particles, including zinc whiskers. These metallic particles are conductive and can short circuit electronic components. Use every effort to ensure that the environment is as dust and particulate free as possible. See following heading titled “Metallic Particulate Contamination” for additional details.

Smaller particles can pass though some filters and over a period of time, cause problems in mechanical parts. Small dust particles can be prevented from entering the computer room by maintaining the air conditioning system at a high static air pressure level.

Other sources of dust, metallic, conductive, abrasive, and/or microscopic particles can be present. Some sources of these particulates are:

- Subfloor shedding
- Raised floor shedding
- Ceiling tile shedding

These particulates are not always visible to the naked eye. A good check to determine their possible presence is to check the underside of the tiles. The tile should be shiny, galvanized, and free from rust.

The computer room should be kept clean. The following guidelines are recommended:

- Smoking—Establish a no-smoking policy. Cigarette smoke particles are eight times larger than the clearance between disk drive read/write heads and the disk surface.
- Printer—Locate printers and paper products in a separate room to eliminate paper particulate problems.

- Eating or drinking—Establish a no eating or drinking policy. Spilled liquids can cause short circuits in equipment such as keyboards.
- Tile floors—Use a dust-absorbent cloth mop rather than a dry mop to clean tile floors.

Special precautions are necessary if the computer room is near a source of air pollution. Some air pollutants, especially hydrogen sulfide (H_2S), are not only unpleasant but corrosive as well. Hydrogen sulfide damages wiring and delicate sound equipment. The use of activated charcoal filters reduces this form of air pollution.

Metallic Particulate Contamination

Metallic particulates can be especially harmful around electronic equipment. This type of contamination may enter the data center environment from a variety of sources, including but not limited to raised floor tiles, worn air conditioning parts, heating ducts, rotor brushes in vacuum cleaners or printer component wear. Because metallic particulates conduct electricity, they have an increased potential for creating short circuits in electronic equipment. This problem is exaggerated by the increasingly dense circuitry of electronic equipment.

Over time, very fine whiskers of pure metal can form on electroplated zinc, cadmium, or tin surfaces. If these whiskers are disturbed, they may break off and become airborne, possibly causing failures or operational interruptions. For over 50 years, the electronics industry has been aware of the relatively rare but possible threat posed by metallic particulate contamination. During recent years, a growing concern has developed in computer rooms where these conductive contaminants are formed on the bottom of some raised floor tiles.

Although this problem is relatively rare, it may be an issue within your computer room. Since metallic contamination can cause permanent or intermittent failures on your electronic equipment, Hewlett-Packard strongly recommends that your site be evaluated for metallic particulate contamination before installation of electronic equipment.

Electrostatic Discharge (ESD) Prevention

Static charges (voltage levels) occur when objects are separated or rubbed together. The voltage level of a static charge is determined by the following factors:

- Types of materials
- Relative humidity
- Rate of change or separation

Static Protection Measures

Follow these precautions to minimize possible ESD-induced failures in the computer room.

- Maintain recommended humidity level and airflow rates in the computer room.
- Install conductive flooring (conductive adhesive must be used when laying tiles).
- Use conductive wax if waxed floors are necessary.
- Ensure that all equipment and flooring are properly grounded and are at the same ground potential.
- Use conductive tables and chairs.
- Use a grounded wrist strap (or other grounding method) when handling circuit boards.
- Store spare electronic modules in antistatic containers.

Acoustics (noise reduction)

Computer equipment and air conditioning blowers cause computer rooms to be noisy. Ambient noise level in a computer room can be reduced as follows:

- Dropped ceiling—Cover with a commercial grade of fire-resistant, acoustic rated, fiberglass ceiling tile.
- Sound deadening—Cover the walls with curtains or other sound deadening material.
- Removable partitions—Use foam rubber models for most effectiveness

3 HP Blade Server bh7800 Power

This chapter provides part numbers for all the cord sets (power cords) available for the bh7800 server. Basic power up and power down is covered. The power distribution unit information and cord set part numbers complete the chapter.

HP Blade Server Initial Power-Up

Before applying power to the bh7800, verify that the terminal (a PC with a terminal emulator installed will suffice) is connected to the management blade and turned on.

Power Cords Supplied

Each bh7800 power supply uses a C19 type receptacle. There are multiple power cord options available for the bh7800. Table 3-1 contains a list of the power cords approved to ship with the bh7800. The geographic location typically determines which power cords ship with the server.

Table 3-1 Server Chassis Power Cords

Part Number	Plug Type at Power Supply	Cord Description	Cord Length
8120-6894	C19	100-120 V North America 5-20P	4.5 m
8120-6895	C19	Unterminated International/Europe	4.5 m
8120-6897	C19	IEC-309	4.5 m
8120-6899	C19	CEE 7-7	4.5 m
8120-6903	C19	L6-20	4.5 m
8121-0070	C19	GB 1002	4.5 m
8121-0161	C19	ISI-32	2.5 m

Powering up the bh7800 consists of powering up the chassis and powering up the server blades. These two power on operations occur nearly simultaneously.

NOTE To ensure a successful power-up, make sure that all slots are covered so that air flow integrity is maintained.

Chassis Power-Up

CAUTION Before applying power to the bh7800, the power receptacle must be verified by a qualified HP representative or a qualified electrician to ensure proper grounding and line voltage level is present.

Step 1. Plug in the power cords between the bh7800 power supplies and the power outlets. The bh7800 chassis will immediately begin to power-up and the monitor will display power-up self test data. The green LED on each power supply should be ON.

Step 2. Look for the status LED on the management blade slot for the front LCD panel (slot F9). When chassis power-up has been successfully accomplished, the management blade status LED will be green. You can now log on to the management blade to perform chassis and blade configuration.

HP Server Power-Up

Step 1. Locate the server blade in slot F1 (server front, slot 1) and plug in a VGA monitor to the monitor port.

Step 2. Plug in a keyboard to one of the two USB ports on the same server blade in slot F1. Without further interaction, the VGA monitor will begin to display boot/self test data and, upon successful completion of boot and self test procedures, the login prompt will be displayed. When server blade power-up has been successfully completed, the status LED for slot F1 will be green.

All server blades power up simultaneously and, when the Green LED above each server blade slot is illuminated, they are ready for configuration.

Blade Server Power-Down

NOTE Power-down procedures primarily apply to server blades. The chassis is powered down only after all server blades are shut down.

Shut Down A Selected HP Server

This procedure is focused on an individual blade.

Step 1. At the login prompt on the slot F1 VGA monitor, enter the appropriate command to halt the OS and observe the screen messages. When the "power down" message appears, the blue "hot-swap" LED will illuminate. Power-down is now complete.

Step 2. The server blade can now be safely removed from the server.

NOTE If a server blade is being removed, a maximum of three minutes is allowed to cover the opening, either with a server blade or a slot cover. After three minutes, the server chassis will begin a power-down sequence to prevent the other server blades from overheating.

Emergency Chassis Power-Down

The bh7800 is designed to run continuously. Under normal conditions, only the server blades, all of which are hot pluggable, will be powered-off and on.

Step 1. If there is time, to ensure that no data is lost, perform an orderly shutdown of the server blades then pull the plug out of each power supply.

Step 2. If there is no time, however, simply pull the plug out of each power supply

---

CAUTION If an orderly shutdown of the server blades isn't performed prior to power removal, all unsaved data located on the server blades at that time will be lost.

Connecting AC Power using a PDU

The bh7800 temporarily draws a large inrush current, when first connected to an AC power source. The inrush current is much greater than the bh7800's normal operating current and generally, the AC power source can handle the normal inrush current.

Power Distribution Unit (PDU)

A PDU may be used at customer sites to reduce the number of circuit breaker slots needed.

This PDU may be referred to as a Relocatable Power Tap outside Hewlett-Packard.

CAUTION The bh7800 requires a theoretical maximum of 16.0 amps at 100V AC, 13.9 amps at 115V AC, 8.0 amps at 200V AC and 6.7 amps at 240V AC. Follow local electrical codes for installing the proper sized wiring and circuit breaker for your installation.

When the bh7800 is installed in a HP Rack System/E rack, it can be used with several PDU styles. The following PDUs will work with the bh7800:

- 16 amp 100-240VAC
- 30 amp 200-240VAC
- 60 amp 200-240VAC

The 60 amp PDU takes up 3-EIA units in a Rack System/E rack. Therefore, a maximum of two bh7800 chassis can be mounted in a 2.0m cabinet when using this PDU. Up to three bh7800 chassis can be mounted in the 2.0m Rack System/E rack when using the 30 amp or 16 amp PDU, or an external cabinet PDU/power solution.

Documentation for installation will accompany the PDU. Documentation may also be found at the Rack Solutions Web site at http://www.hp.com/racksolutions.

Table 3-2 contains a list of the power cords approved for the bh7800 for connection to a PDU or UPS as noted in the cord description column.

Table 3-2 PDU and UPS Power Cords

Part Number	Plug Type at Power Supply	Cord Description	Cord Length
8120-6884	C19	C19/C20 Jumper Cord from PDU to Server	2.5 m
8120-6961	C19	C19/C20 Jumper Cord from PDU to Server	4.5 m
8120-8494	C19	240V NA UPS C19/L6-30P	4.5 m

A System Specifications and Requirements

This appendix contains specific parameters applicable to the bh7800 server. Temperature, power requirements, and power dissipation figures are provided.

System Specifications

NOTE The Marked Electrical for the bh7800 server is 16 A. The recommended circuit breaker size is 20 amps for North America. For countries or areas outside North America, consult your local electrical authority having jurisdiction for the recommended circuit breaker size.

Table A-1 bh7800 Specifications

Parameter	Characteristics
Nominal input voltage range	100 to 240 Volts AC (single wide range)
Operating voltage (min/max)	90 to 264 Volts AC
Frequency range (non-strappable) 50 - 60 Hz	47 to 63 Hz
Number of phases	One
Inrush current (maximum peak)	35 Amps
Theoretical Maximum input current[a]	16 Amps
Power cords[b]	Two for normal operation but can run on one. Systems are always sold with two power supplies.
Acoustics	Not to exceed 70.0 dB at operator level Not to exceed 7.5 Bels
KVA rating	1.6 @ 100 - 240V AC
Power factor	0.98 @ 100 - 240V AC
Ground leakage current (mA)	Less than 1.75 mA per supply

a. With future upgrades.
b. The bh7800 ships with two power supplies and each supply has it's own power cord. The AC input to the bh7800 is divided into two separate and redundant power supplies. Both power cords should always be plugged in and supplying power to the bh7800.

Figure A-1 Power Supply Label

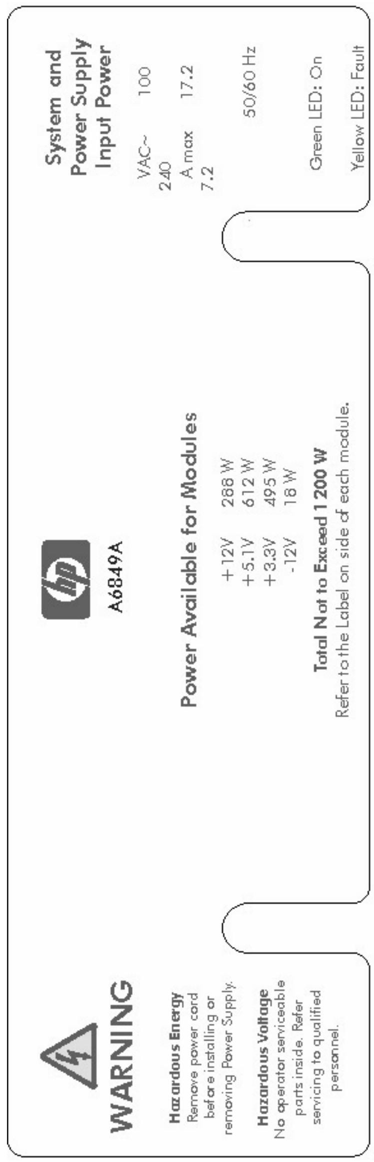


Table A-2 Environmental Conditions

Parameters	Conditions
Temperature	
Operating	68 °F to 77 °F (20 °C to 25 °C) **Recommended** 41 °F to 95 °F (5 °C to 35 °C) up to 5000 feet[a]
Non-Operating	-40 °F to 158 °F (-40 °C to 70 °C) (Storage)
Shock Immunity	18 °F per hour (10 °C) (Maximum Rate of Change)
Humidity (noncondensing)	
Operating	40% to 60% RH at 72(F (22 °C) **Recommended**
Non-Operating	5% to 90% RH at 149(F (65 °C) (Storage)
Altitude (ASL)	
Operating	0 to 3,048 m (10,000 ft)
Non-Operating	0 to 4,572 m (15,000 ft)

a. Above 5000 feet, derate 1 °C per 1000 feet altitude to 30 °C at 10,000 feet.

Table A-3 Weight and Dimensions

Maximum Weight	Approximately 180 lbs (81.65 kg.), depending on configuration - excludes keyboard and monitor.
Height	22.5 inches (57.15 cm)
Width	16.73 inches (42.49cm)
Depth	18.0 inches (45.72 cm)
Required front clearance for access	36 inches (91.44 cm)
Required rear clearance for access	36 inches (91.44 cm)

Table A-4 Power Dissipation (Theoretical Maximum)

Component	Watts[a]
Chassis	0.0 Watts
HP Server bc1100	23.6 Watts
Network Blade	7.5 Watts
Management Blade	18.6 Watts
Management LAN Blade	0.1 Watts

a. Use these wattage values to perform calculations in Table A-5.

This table can be copied and used to plan your air conditioning requirements for your server(s). Use the footnotes at the bottom of this page to assist in calculating the values.

See Table A-6 for an example of how to arrive at a value required for air conditioning based on the system configuration described for Table A-6.

Table A-5 Power Dissipation and Air Conditioning Requirement Summary

Component	Quantity	Multiply Qty. by Watts value then divide total Watts by 0.7[a]	Power Dissipated (expressed in kilowatts)	Air Conditioning Required (expressed in tons)[b]
Chassis	1	Watts = 0	Watts = 0	0.0
HP Server bc1100	1 to 16			
Network Blade	1 or 2			
Management Blade	1			
Management LAN Blade	1 or 2			
Power Supply[c]	2	Accounted for (see footnote)	Accounted for (see footnote)	Accounted for (see footnote)
Totals	N/A	N/A		

a. For example, if you have two bc1100 blades the calculation for this would be: (2 x 23.6 Watts)/0.7 = 67.43 Watts.
b. Air Conditioning Required = kilowatts/3.517 = tons needed
c. The power supply thermal load is included in the value calculated for the blades. The power supply efficiency is 0.7 so when you divide by 0.7, the resulting value represents the thermal load of the blade plus the thermal load in the supply due to each blade.

To illustrate how to use Table A-5, let us assume that we have a single chassis server loaded with 10 HP server bc1100 blades, one network blade, one management blade, and two management LAN blades.

Table A-6 Power Dissipation and Air Conditioning Requirement Example

Component	Quantity	Multiply Qty. by Watts value then divide total Watts by 0.7[a]	Power Dissipated (expressed in kilowatts)	Air Conditioning Required (expressed in tons)[b]
Chassis	1	Watts = 0	Watts = 0	0.0
HP Server bc1100	10	337.14	0.337	0.096
Network Blade	1	21.43	0.021	0.006
Management Blade	2	26.57	0.027	0.008
Management LAN Blade	2	0.286	0.0003	0.0001
Power Supply	2	Accounted for	Accounted for	Accounted for
Totals	N/A	N/A	0.385	0.11

a. For example, if you have two bc1100 blades the calculation for this would be: (2 x 23.6 Watts)/0.7 = 67.43 Watts
b. Air Conditioning Required = kilowatts/3.517 = tons needed

Table A-6 indicates that 0.167 tons of air conditioning is required for this server example.

B Power Plug Configuration

There are several different cord sets (power cables) designed for the bh7800. The country or area destination will determine which cord set ships with the bh7800. This guide provides the site preparation specialist with the knowledge of what to expect to receive based on their geographic destination.

Cord Set Description

The power cables (cord sets) shipping with the bh7800 will be 4.5 meter or 2.5 meter long cables. The cord set below shows a 5-20P plug on one end and the C19 female plug on the other end.

Figure B-1 Cord Sets

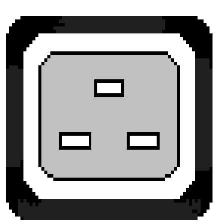
Example of a 5-20P to C19 Cord Set

Female End of Cord Set

The female plug for the bh7800 is a C19 type plug that mates with the C20 receptacle in each power supply installed in the bh7800.

Figure B-2 Male Receptacle to Female Plug

C20 Male Receptacle
(at power supply)



C19 Female Plug
(on cord set end)

Male End of Cord Set

Depending on the country or area the bh7800 is shipped to, the male plug on the other end of the power cable will vary.

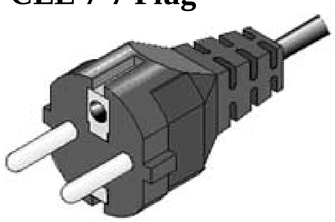
Figure B-3 Male Plug Types

Unterminated Plug

L6-20 Plug

IEC 309 Plug

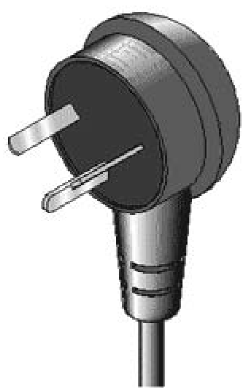
CEE 7-7 Plug



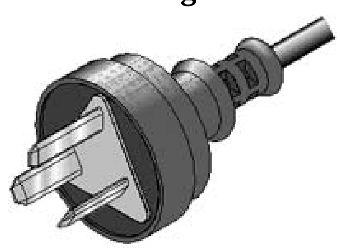
L6-30 Plug

NEMA 5-20P Plug

ISI 32 Plug



GB 1002 Plug



C Conversion Factors and Formulas

Conversion factors and formulas for data calculations for systems not conforming specifically to the configurations listed in this Site Preparation Guide are provided. Conversion factors used in this document are provided.

Conversion Factors

Refrigeration

- 1 watt = kcal/h
- 1 watt = 3.412 Btu/h
- 1 watt = 2.843 x 10^{-4} tons
- 1 ton = 200 Btu/min
- 1 ton = 12,000 Btu/h
- 1 ton = 3,517.2 W

Metric Equivalents

- 1 centimeter = 0.3937 in
- 1 meter = 3.28 ft
- 1 meter = 1.09 yds
- 1 in. = 2.54 cm
- 1 ft = 0.305 m
- 1 CFM = 1.7m^3/h

KVA Conversion

Three Phase

Equation C-1

$$KVA = V \times A \times (\sqrt{3}) / 1000$$

Single Phase

Equation C-2

$$KVA = V \times A / 1000$$

Formulas

- KVA = Voltage x Current (amps)
- Watts = VA x PF
- BTU = Watts x 3.41

Glossary

A-B

Apparent power A value of power for AC circuits that is calculated as the product of RMS current times RMS voltage, without taking the power factor into account.

ASHRAE Standard 52-76 Industry standard for air filtration efficiency set forth by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.

ASL Above sea level.

Btu/h The abbreviation for British thermal units. The amount of heat required to raise one pound of water one degree fahrenheit per hour, a common measure of heat transfer rate.

C-D

CompactPCI The newest specification for PCI-based industrial computers is called CompactPCI. It is electrically a superset of desktop PCI with a different physical form factor. See http://www.picmg.org/compactpci.stm for details.

CFM The abbreviation for cubic feet per minute, commonly used to measure the rate of air flow in an air conditioning system.

Chilled water system A type of air conditioning system that has no refrigerant in the unit itself. The refrigerant is contained in a chiller, which is located remotely. The chiller cools water, which is piped to the air conditioner to cool the space.

Dehumidification The process of removing moisture from the air within a critical space.

Derate To lower the rated capability of an electrical or mechanical apparatus.

Downflow Refers to a type of air conditioning system that discharges air downward, directly beneath a raised floor, commonly found in computer rooms and modern office spaces.

E-K

EIA unit The Electronic Industries Association (EIA) defines this unit of measurement to be 1.75 inches in height. So then, 1U equals 1.75 inches (1U equals 44.45 mm).

Hot Pluggable An item is hot pluggable if it can be added to or removed from a chassis while the chassis remains operational, but requires software intervention to do the operation. An example of hot-pluggable items are server blades. These items are hot pluggable to the extent that OS and hardware support is present. Also see hot swappable below.

Hot Swappable An item is hot swappable if it can be added to or removed from a chassis while the chassis remains operational, and requires no software intervention. Examples of hot-swappable items are power supplies and fans. These items are hot swappable assuming their removal does not create an N-1 situation (for example, if a chassis's power status is n+1 then a power supply can be removed without affecting the operation of the chassis). Also see hot pluggable above.

Humidification The process of adding moisture to the air within a critical space.

IA-32 Intel Architecture; 32-bit

IDE acronym for Integrated Device Electronics

Inrush current The peak current flowing into a power supply the instant AC power is applied. This peak is usually much higher than the typical input current due to the charging of the input filter capacitors. When switching power supplies are first turned on, they present high initial currents as a result of filter capacitor impedance. These large filter capacitors act like a short circuit, producing an immediate inrush surge current with a fast rise time. The peak inrush current can be several orders of magnitude greater than the supply's typical current.

KVA Abbreviation for kilovolt-amperes. (1000 x volt-amperes)

L-N

Latent cooling capacity An air conditioning system's capability to remove heat from the air.

Leakage current A term relating to current flowing between the AC supply wires and earth ground. The term does not necessarily denote a fault condition. In power supplies, leakage current usually refers to the 60 Hertz current, which flows through the EMI filter capacitors that are connected between the AC lines and ground.

Maximum input current The operating current of the product equal to the maximum load divided by the minimum input voltage.

NEBS All electronic equipment has the potential to interfere with other electronic equipment. Interference can be caused by electromagnetic radiation, the grounding system, the electrical power connection, excessive heat or blocking the natural airflow, and connecting wires or cables. The FCC (Federal Communications Commission) regulates a portion of this problem through Part 15 of their rules and regulations. Even more stringent than the FCC Part 15 requirements, Network Equipment Building Standards (NEBS) covers a large range of requirements including criteria for personnel safety, protection of property, and operational continuity. The documents cover both physical requirements including: Space Planning, Temperature, Humidity, Fire, Earthquake, Vibration, Transportation, Acoustical, Air Quality and Illumination; and electrical criteria including: Electrostatic Discharge (ESD), Electromagnetic Interference (EMI), Lightning and AC Power Fault, Steady State Power Induction, Corrosion, DC Potential Difference, Electrical Safety and Bonding and Grounding.

O-R

PCA Abbreviation for Printed Circuit Assembly also referred to as a Printed Circuit Board (PCB).

PCI Currently, the most popular local I/O bus, the Peripheral Component Interconnect (PCI) bus was developed by Intel and introduced in 1993.

PICMG A consortium of companies involved in utilizing PCI for embedded applications. The PCI Industrial Computer Manufacturers Group (PICMG) controls the PICMG specification.

Power factor The ratio of true power to apparent power in an AC circuit. In power conversion technology, power factor is used in conjunction with describing the AC input current to the power supply.

RMS Root-mean-square (RMS) refers to the most common mathematical method of defining the effective voltage or current of an AC wave. To determine RMS value, three mathematical operations are carried out on the function representing the AC waveform: (1) The square of the waveform function (usually a sine wave) is determined. (2) The function resulting from step (1) is averaged over time. (3) The square root of the function resulting from step (2) is found.

S-T

Theoretical maximum power consumption

Represents the maximum wattage of a given configuration, assuming worst-case conditions (thermal tolerances, workloads, and so forth) on all system components. It is extremely unlikely that any customer will experience this level of power consumption.

Tonnage The unit of measure used in air conditioning to describe the heating or cooling capacity of a system. One ton of heat represents the amount of heat needed to melt one ton (2000 lbs.) of ice in one hour. 12,000 Btu/hr equals one ton of heat.

True power In an AC circuit, true power is the actual power consumed. It is distinguished from apparent power by eliminating the reactive power component that may be present.

Typical input current The operating current of the product measured using a typical load and target voltage.

Typical power consumption Represents the expected power consumption of a given configuration. The typical value is the approximate power consumption that a customer will most likely experience and can use for power budgeting purposes.

U-Z

USB USB is a serial bus used for human interface devices as well as low-bandwidth multimedia devices. It is fully plug and play and hot pluggable.

Vapor seal A vapor seal is an essential part of preventing moisture infiltration into or migration out of a critical space, such as a data processing center or other room that contains sensitive electronic instrumentation. Essentially, a vapor seal is a barrier that prevents air, moisture, and contaminants from migrating through tiny cracks or pores in the walls, floor, and ceiling into the critical space. Vapor barriers may be created using plastic film, vapor-retardant paint, vinyl wall coverings and vinyl floor systems, in combination with careful sealing of all openings (doors and windows) into the room.

VGA acronym for Video Graphics Adapter

Watt A unit of electricity consumption representing the product of amperage and voltage. When the power requirement of a product is listed in watts, you can convert to amps by dividing the wattage by the voltage. (e.g., 1200 watts divided by 120 volts is 10 amps.